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NEW NORTH AMERICAN FLEAS

BY ROBERT TRAUB

During the course of investigations of adult and larval Siphonaptera in the collections of Cornell University and the University of Illinois, several apparently undescribed genera and species were discovered. One new genus and four new species are herein described. The war has interrupted further studies, especially on the collections from Mexico and Central America in Field Museum, and on my own Mexican collections. I am indebted to Dr. W. L. Jellison of the United States Public Health Service, Dr. M. A. Stewart of the University of California, and Mr. George P. Holland of the Department of Agriculture of British Columbia for aid in the study of *Doratopsylla hamiltoni* sp. nov., and to Dr. Karl Jordan, of the British Museum, for advice regarding the new genus *Jellisonia*. My thanks are due also to Dr. Robert Matheson of Cornell University, to Professor J. S. Stanford of the Utah State Agricultural College, and to Mr. William J. Gerhard, Curator of Insects at Field Museum of Natural History, for making possible the study of the collections in their charge. The type of *Jellisonia klotsi* and paratypes of the remaining new forms have been deposited in Field Museum.

Family Ceratophyllidae

Subfamily Ceratophyllinae

Tribe Ceratophilini

*Jellisonia*¹ gen. nov.

Genotype *Jellisonia klotsi* sp. nov.

¹ The genus is named for Dr. W. L. Jellison of the United States Public Health Service, who has contributed much to the knowledge of North American Siphonaptera.

Diagnosis.—A genus of fleas nearly related to *Pleochaetis* Jordan (1933, p. 77). Distinguished from *Pleochaetis* by having the dorso-lateral bristles of the tibiae, from middle to apex, short and virtually uniform, forming a comb as in *Peromyscopsylla* and *Leptopsylla*; further distinguished in having a prominent stout bristle directed cephalad, near the apex of the distal arm of the ninth sternum in the male; male with eighth sternum and eighth tergum spiculose, and with the intersegmental membrane between the eighth and ninth segments more or less expanded and spiculose; body of receptaculum seminis of female strongly convex above, somewhat concave below, its dorsal and ventral surfaces thus almost parallel; style of female without a dorsal bristle, with one long apical bristle and one shorter ventral one; style elongate, about four times as long as its width at the base.

The genus *Jellisonia* is found on various mice in Mexico. The author's collection includes undescribed species collected in Nuevo Leon, Vera Cruz, and Michoacan.

*Jellisonia klotsi*¹ sp. nov.

Type from Cerro Tancitaro, near Tancitaro, Michoacan, Mexico. Altitude 8,000 feet. A male in the collection of Field Museum of Natural History. Collected from a harvest mouse, *Reithrodontomys c. chrysopsis*, July 12, 1941, by Robert Traub (Fourth Hoogstraal Biological Expedition to Mexico).

Paratypes.—Twelve males and seven females, 7,800 to 10,500 feet altitude, on Cerro Tancitaro, July 5–24, 1941, all from the same mouse. Allotype from same specimen as the type, also in Field Museum of Natural History. Paratypes to be distributed.

Diagnosis.—Head, male and female: Frons evenly rounded, with median tubercle small but distinct; stippled cephalad of first row of bristles; preantennal region with three rows of bristles, the anterior row somewhat irregular, with eight bristles, smallest near base of antenna; middle row with four well-developed bristles; posterior row with three large bristles, the largest cephalad and dorsad of eye; a series of about four tiny hairs inserted along antennal groove cephalad and dorsad of eye. Eye conspicuous, well pigmented. Genal process fairly broad, becoming acuminate. A small seta near base of four-segmented maxillary palpus; maxilla an acute triangle, extending to apex of second segment of five-segmented labial palpus;

¹ The species is named for Dr. A. B. Klots, who has helped the author on innumerable occasions.

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NORTH AMERICAN FLEAS—TRAUB

213

labial palpus about three-quarters length of forecoxa. Bristles on second antennal segment short, shorter than or subequal to second segment. A row of tiny hairs caudad of first antennal segment and of antennal groove; postantennal region with three rows of bristles, the most anterior row with four bristles; the middle with five; the caudal with five or six large bristles, with some small intercalated hairs.

Thorax: Eighteen spines in pronotal ctenidium; a row of five bristles cephalad on each side, a few fine hairs intercalated between some of the bristles. Mesonotum and metanotum each with three rows of bristles, but first row very incomplete. Mesepisternum with two bristles, one larger median, and one smaller, and with one fairly large bristle near ventro-caudal border. Mesepimeron with three rows of bristles, three, three, and two; the two posterior ones the longer. Supraepisternum of metathorax well developed, with two caudal bristles; infraepisternum with one bristle in dorso-caudal angle. Metaepimeron with bristles in two irregular rows of four, plus one in the dorso-caudal angle.

Legs: Prothoracic femora with about ten small thin lateral bristles; meso- and metathoracic femora with one each. Apical half of pro- and mesotibiae with dorso-lateral bristles short and subequal, forming a comb. Comb extending proximad of middle on hind tibia. Protibiae about equal to length of proximal three tarsal segments; mesotibiae and hind tibiae shorter than proximal two segments of respective tarsi. Basal segment of protarsus about equal to second and fifth, but longer than third and fourth. Basal segment of midtarsus slightly shorter than second and third combined; second almost equal to third and fourth combined, and slightly longer than fifth. Basal segment of hind tarsus about equal to second and third combined; second equal to third and fourth combined; fifth and third subequal. Fourth segment in each case the smallest. Distal tarsal segment of each leg with four pairs of lateral plantar bristles and a somewhat displaced median basal pair.

Abdomen: Both sexes with two rows of bristles on abdominal segments 2–6; cephalic row of small bristles, not reaching spiracles; caudal row of larger bristles extending ventrad to level of spiracles; tiny hairs intercalated between those of larger row. One bristle on each side on basal sternum.

Sexual differences in abdomen: First tergum of male with one or two teeth on each side and with three rows of bristles, the first row very incomplete; second and third terga with two teeth on each side,

fourth with one. Female with first tergum with three rows of bristles, first row very incomplete; with tergal teeth as follows: 1, 2, 2, 1.

In female, sterna 3–6 bear bristles on each side as follows: 3, 2 (or 3), 2, 2. Male with these bristles 2, 2, 2, 1. Male with middle antepygidial bristle well developed, others vestigial. Female with three antepygidial bristles, middle one twice length of others.

Subfamily Neopsyllinae

Tribe Neopsyllini

*Epitedia stanfordi*¹ sp. nov.

Type from Fillmore, Millard County, Utah. In Field Museum of Natural History. Collected from *Peromyscus truei* Shufeldt, October 21, 1939, by L. Leatham and J. S. Stanford.

Paratypes.—Allotype female, with the same data as type, in Field Museum of Natural History. An additional male and two females in the author's private collection.

Diagnosis.—Separated from all known *Epitedia* by the prominent caudally directed process immediately ventrad to each group of antepygidial bristles. This projection is especially developed in the male. Also characteristic in that the apical portion of the distal arm of the ninth sternum bears eight small teeth, in addition to the larger four along the margin, and in that the tenth sternum of the female bears only one long bristle on its ventrocephalic angle, not a clump of two or three bristles.

Near *Epitedia wenmanni* Rothschild (1904, p. 642), the immovable process of the male clasper being divided into a cephalic and a caudal process, the cephalic process extending farther dorsad than the caudal one; no spiniforms at the ventro-caudal margin of the movable finger or exopodite; caudal margin of the exopodite straight, not concave; the tail of the receptaculum seminis of the female clearly extending into the head; dorsal and ventral antepygidial bristles each about one-third the length of the middle one. Separated from *E. wenmanni* by the distal arm of the ninth sternum of the male being straight, not elbowed, and bearing marginal hairs as far apically as the smaller spines, not merely proximad of the spines; the apical portion of the distal arm of the ninth sternum with eight small teeth, in two rows of six and two, in addition to the four

¹ This species is named for Professor J. S. Stanford, who has contributed much to our knowledge of Siphonaptera.

large marginal teeth. *E. wenmanni*, in contrast, has only four small ventral teeth in addition to the marginal four. The new species has the caudal margin of the caudal process of the male immovable clasper trigonal, not rounded, and bearing some bristles in a row for two-thirds its length instead of merely a few at the apex and one far ventrad at the base of the exopodite; the receptaculum seminis of the female is longer and narrower than that of *E. wenmanni*, the maximum width of the head being only twice the diameter of the tail where it enters the head, not three times; and the seventh sternum of the female bears a shallower, more evenly rounded sinus than that of *E. wenmanni*.

Although the receptaculum seminis of *E. stanfordi* is much like that of *Epitedia faceta* Rothschild (1915b, p. 34), the species are very distinct. In *E. faceta* the male bears two recurved spiniforms at the ventro-caudal angle of the exopodite, the caudal margin of the exopodite is concave, and the cephalic lobe of the immovable process is at a level with the caudal lobe. Additional differences are pointed out in the key and in the discussion of *E. faceta* below.

Epitedia faceta Rothschild.

Neopsylla faceta Rothschild, Ectoparasites, 1, p. 32, 1915; Chapin, Bull. Brooklyn Ent. Soc., 14, p. 50, 1919; Jordan, Nov. Zool., 35, p. 176, 1929.

Epitedia faceta Jordan, Nov. Zool., 41, p. 124, 1938; Fox, Fleas of Eastern U. S., p. 98, 1940; Wagner, Zeit. Parasit., 11, p. 465, 1940.

This flea has been known only from the original pair described by Rothschild. A small series of fleas in the collection at Cornell University agrees almost exactly with the original description. There are two males and two females from *Glaucomys volans*, the flying squirrel, taken at Ithaca, New York, by D. E. Sollberger, September 14, 1937, and one male and two females probably taken on the same host and in the same locality by Professor J. S. Stanford, January 9, 1928. Two pairs of these specimens are now in the Cornell University Collection and the remainder are in my own collection. While the types of this species came from a red squirrel, *Sciurus hudsonicus*, there is some indication that it may be characteristic of *Glaucomys* and may be a nest form.

KEY TO KNOWN SPECIES OF EPITEDIA IN THE UNITED STATES *Males* (the male of *E. testor* Rothschild is not known)

1. Process of clasper undivided.....	2
Process of clasper divided to form two lobes.....	3

2. Exopodite or movable finger about three times as long as wide at greatest point; dorsal margin of apex of distal arm of ninth sternum evenly rounded, not peaked.
E. scapani Wagner (1936b, p. 657) = *E. jordani* Hubbard (1940, p. 10)
 Exopodite or movable finger about four or five times as long as wide at greatest point; dorsal margin of distal arm of ninth sternum angulate or with a peak near the apex, not even rounded.....*E. stewarti* Hubbard (1940, p. 11)

3. With a prominent caudally directed process immediately ventrad to each group of antepygidal bristles; apex of distal arm of ninth sternum with about eight spines or teeth in addition to the larger marginal four; caudal border of caudal process trigonal, not evenly rounded.....*E. stanfordi* sp. nov.
 Without a prominent caudally directed process immediately ventrad to each group of antepygidal bristles; apex of distal arm of ninth sternum with only three or four spines in addition to the larger marginal four, although perhaps with one or two hairs; caudal margin of caudal process evenly rounded, not angular..... 4

4. Exopodite or movable finger with caudal margin definitely concave and bearing two recurved spiniforms at the ventro-caudal angle; apex of cephalic process nearly on a level with that of caudal process; with only three spines, and a few stout hairs, proximad of the marginal four teeth on the apex of the distal arm of the ninth sternum.....*E. faceta* Rothschild (1915b, p. 32)
 Exopodite or movable finger with a straight caudal border, not concave, and without recurved spiniforms at the ventro-caudal angle; apex of cephalic process definitely extending more dorsad than caudal process; with four spines proximad of the marginal four teeth on apex of the distal arm of the ninth sternum.....*E. wenmanni* Rothschild (1904, p. 642)

Females

1. Tail of receptaculum seminis deeply projecting into lumen of head (body); head of receptaculum seminis concave above; upper and lower antepygidal bristles about one-third the length of the middle one..... 2
 Tail of receptaculum seminis not evidently projecting into head (body); head of receptaculum seminis convex above, upper and lower antepygidal bristles very small, only about one-fourth the length of the middle one..... 5

2. With a definite, caudally directed process, immediately ventrad to each group of antepygidal bristles; with only one long bristle on the ventro-cephalic angle of the tenth sternum (substylar flap); head of receptaculum seminis definitely concave above, relatively narrow, and at its maximum only about twice the width of the tail where it enters the head....*E. stanfordi* sp. nov.
 Without a caudally directed process immediately ventrad to each group of antepygidal bristles; with a group of two or three bristles at the ventro-anterior angle of the tenth sternum (substylar flap); head of receptaculum seminis as above or shallowly concave dorsally, and wider, about three times the width of the tail where it enters the head..... 3

3. Seventh sternum with three long bristles and three or four short ones on each side (known only from one female, which is in England, and original description).....*E. testor* Rothschild (1915b, p. 34)
 Seventh sternum with four or five long bristles and five to seven shorter ones on each side..... 4

4. Head of receptaculum seminis definitely concave above, relatively narrow, being at its maximum only twice the width of the tail where it enters the head; seventh sternum on each side with a row of four long bristles, a dorsal group of two and a ventral group of two, and five cephalic and ventrocephalic small ones; labial palpus extending about seven-eighths of the length of the forecoxa.....*E. faceta* Rothschild (1915b, p. 32)

Head of receptaculum seminis shallowly or scarcely concave dorsally, wider, being at its maximum about three times the width of the tail where it enters the head; seventh sternum on each side with five long bristles in a more dorsal group of three and a more ventral group of two, and cephalad to these are seven smaller ones; labial palpus extending only two-thirds or three-quarters the length of the forecoxa.....*E. wenmanni* Rothschild (1904, p. 642)

5. Sinus of seventh sternum evenly rounded, like half an ellipse, shallow; lobe of this sinus of seventh sternum also evenly rounded.

E. stewarti Hubbard (1940, p. 11)

Sinus of seventh sternum deeper but not evenly rounded, somewhat like a quarter of a circle; lobe of this sinus of seventh sternum ventrally somewhat extended caudally, at times acutely.

E. scapani Wagner (1936b, p. 657) = *E. jordani* Hubbard (1940, p. 10)

Family Ctenopsyllidae

Subfamily Ctenopsyllinae

Tribe Ctenopsyllini

Peromyscopsylla duma sp. nov.

Type from Logan Canyon, Cache County, Utah. A male in the collection of Field Museum of Natural History. Collected from *Microtus* sp., September 1, 1938, by Professor J. S. Stanford.

Paratypes.—Ten females, from *Microtus* sp. (allotype from Logan), *Clethrionomys* sp., and *Peromyscus* sp., from Logan and Hyrum, Cache County, Utah, August and September, 1938, all collected by J. S. Stanford. One allotype and one paratype in Field Museum of Natural History.

Diagnosis.—Related to *Peromyscopsylla selenis* Rothschild (1906, p. 322) in that the distal arm of the ninth sternum of the male lacks marginal bristles in the apical half and bears three bristles and a proximad row of hairs near its base. Distinct in that the apical margin of the eighth sternum of the male bears only three long bristles and one small hair on each side, instead of four long bristles and two small hairs; in that the ventral margin of this sternum has a definite sinus and is not straight as in *P. selenis*; the lowest large bristle along the caudal border of the exopodite of the male is dorsal to the midpoint of the margin, while in *P. selenis* this bristle is

definitely ventral to the midpoint; the caudal margin of the exopodite is not semicircular but is ventrally straighter so that the exopodite is somewhat triangular, with a rounded dorsal apex. The seventh sternum of the female has a very shallow wide sinus that extends almost from the ventral margin to the dorsal lobe, in contrast to *P. selenis*, which bears a small, deeper sinus that is only as wide as the lobe ventrad. In the new species the female seventh sternum bears six or seven long bristles in a row while that of *P. selenis* has five bristles in an irregular line.

The related *Peromyscopsylla catatina* is easily separated from the new species. *P. catatina* bears only three bristles on each side of the eighth sternum of the male, not seven as in the new species, and the ninth sternum of the male bears a series of five or six longish bristles near the base of the distal arm, not three. The apical margin of the seventh sternum of the female of *P. catatina* is very different also, and bears a ventrally directed shallow short sinus, and the margin ventrad of the sinus is convex. In *P. duma* the sinus is so shallow and wide that it extends to the ventral margin.

Tribe Doratopsyllini

*Doratopsylla (Corrodopsylla) hamiltoni*¹ sp. nov.

Type from Champaign, Champaign County, Illinois. A male, in the collection of Field Museum of Natural History. Collected from short-tailed shrew, *Blarina brevicauda* Say, November 17, 1940, by Robert Traub.

Paratypes.—The allotype, in Field Museum of Natural History, from the same species of shrew as the type, taken at Piper City, Iroquois County, Illinois, by E. J. Koestner and Robert Traub. Five males and two females from Urbana and Champaign, 1939 and 1940, also from *Blarina brevicauda* (two in Field Museum of Natural History). Two females from lesser short-tailed shrew, *Cryptotis parva* Say, collected at Ithaca, New York, by W. J. Hamilton, Jr.

Diagnosis.—Near *Doratopsylla (Corrodopsylla) curvata* Rothschild (1915a, p. 25) but the genal process above the last genal spine wider, as wide as the last genal spine; without processes or projections between the two groups of antepygidal bristles in the male;

¹ This flea is named for Dr. W. J. Hamilton, Jr., of the Department of Zoology, Cornell University, who has collected some of the paratypes of this species from *Cryptotis parva*.

and the eye vestigial and represented only by the outlines. In *D. curvata* the genal process is narrower than the last genal spine; the eye appears as a relatively pigmented triangular area above the last genal spine; and both sexes bear a pair of processes between the two groups of antepygidial bristles. In the male of the new species the dorsal process of the clasper is somewhat longer than the ventral process and there is no small triangular projection or lobe at the point of junction of the dorsal and ventral processes. In *D. curvata* there is a small but distinct lobe between the processes of the clasper, and, according to Rothschild (1915a, p. 27), the processes are of equal length. However, in Montana specimens of *D. curvata* the dorsal process seems shorter than the ventral. Unlike *D. curvata*, *D. hamiltoni* lacks a hair on the apex of the caudal margin of the ventral process. The ventral process seems shorter and broader in the new species, and the exopodite or movable finger is smaller and wider than that of *D. curvata*. The caudal border of the apex of the distal arm of the ninth sternum of *D. hamiltoni* is rounded, not angular like that of *D. curvata*. In the female of *D. hamiltoni* the dorsal lobe of the seventh sternum is rounded, not straight like that of *D. curvata* and there is no sinus ventrad of the acute tip; and the head of the receptaculum seminis is shorter and broader. The tail of the receptaculum seminis is somewhat dilated at the apex instead of being evenly rounded as in *D. curvata*.

Remarks.—Dr. Jordan in 1929 reported the occurrence of *D. curvata* on *Blarina* in the Adirondacks of New York state. It would be interesting to compare his specimens with the Illinois and Ithaca, New York, specimens of *hamiltoni*. *D. curvata* is a western species, and while it may occur in New York state, Jordan's specimens may prove to be referable to *hamiltoni*.

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INDEX

Current names in roman type, synonyms in *italic* type, new names in **bold-faced** type.

abrocodon, *Phyllotis*, 194
Acanthis *linaria*, 189
Acanthopneuste *kennicotti*, 188
Acmaea (*Collisella*) *asmi*, 14
 persona, 15
 scabra, 14
Acris *crepitans*, 100
acrotricha, *Helicigona* (*Chilostoma*), 21
adamsi, *Gavia*, 182
adamsianus, *Brachidontes* (*Hormomyia*), 14
 Mytilus (*Hormomyia*), 16
aequinoctialis, *Mordellistena*, 127
aestuans, *Sciurus*, 192
Agama *cornuta*, 84, 106
Agelaius *arctolegus*, 189
Agkistrodon *bilineatus*, 113
 pictigaster, 78, 94
Ailuridae, auditory region of skull, 42–45, 50, 56
Ailuropoda *melanoleuca*, auditory region, 42
 masticatory apparatus, 61 ff.
Ailurus *fulgens*, auditory region, 42, 56
Akodon *alterus*, 196
 andinus, 196
 boliviensis, 195
 dolichonyx, 196
 lutescens, 196
 polius, 196
 spiegazzinii, 196
 subfuscus, 195
 tucumanensis, 196
Alaba *interruptilineata*, 17
alascanus, *Falco*, 183
alascensis, *Motacilla*, 189
albifrons, *Petrochelidon*, 187
albofrenata, *Hyla*, 158
aliciae, *Hylocichla*, 188
alonensis, *Iberus*, 20
alterna, *Lampropeltis*, 78, 111, 141
alternus, *Ophibolus*, 111
alterus, *Akodon*, 196
Alvania (*Willetia*) *microgypta*, 2
Amastridium *sapperi*, 136
Ameiva *tesselata*, 106
americana, *Mareca*, 183
Amphipholis *pugetana*, 15
anatum, *Falco*, 184
Ancistrodon *bilineatus*, 113
Andinomys *lineicaudatus*, 195
andinus, *Akodon*, 196
andium, *Phyllotis*, 194
angulata, *Mordellistena*, 129
annulata, *Lampropeltis*, 112
annulatus, *Sceloporus*, 78, 84, 104
Anthus *spinoletta*, 189
antillarum, *Pecten* (*Nodipecten*), 19
apicicornis, *Mordella*, 124
approximans, *Holbrookia*, 104
Arca (*Barbatia*) *reticulata*, 19
arcticola, *Otocoris*, 187
arctolegus, *Agelaius*, 189
Arctonyx *collaris*, auditory region, 47
Arenaria *interpres*, 170
 melanocephala, 170
 morinella, 184
arenarius, *Phyllotis*, 194
arenicolor, *Hyla*, 81, 100
arescens, *Proechimys*, 198
argentatus, *Larus*, 186
Arizona *elegans*, 92, 111
 jani, 145
Arquatella *couesi*, 185
 kurilensis, 178
 tschuktschorum, 174
arra, *Uria*, 186
asmi, *Acmaea* (*Collisella*), 14
Aspidonectes *emoryi*, 82, 103
atriceps, *Homalocranium*, 93, 112
 Tantilla, 78, 93, 112
atripennis, *Mordellistena*, 131
atrox, *Crotalus*, 78, 94, 114
Auditory region, arctoid carnivores, 33
Auriculastra *pellucens*, 18
auritus, *Colymbus*, 183
baileyi, *Crotaphytus*, 78, 82, 103
bairdi, *Elaphe*, 78, 91
 Pisobia, 184
barrovianus, *Larus*, 186
Bassaricyon *medius*, auditory region, 36
Bassariscus *astutus*, auditory region, 36
baueri, *Limosa*, 185
Bears, masticatory apparatus, 61
bendirei, *Falco*, 184
berlandieri, *Rana*, 81, 100
biannulata, *Eunice*, 15
bicolor, *Iridoprocne*, 187
bicornuta, *Polygyra* (*Daedalocheila*), 18
bifurcatus, *Septifer*, 15, 16
bilineatus, *Agkistrodon*, 113
 Ancistrodon, 113
blanchardi, *Diadophis*, 78, 89
 Sonorae, 78, 93
Blarina *brevicauda*, 218
boimensis, *Proechimys*, 199
 boliviensis, *Akodon*, 195
borealis, *Colaptes*, 187
Botula *californiensis*, 8

Brachidontes (*Hormomyia*) adamsianus, 14
 Brachyramphus brevirostris, 187
 Bradypodidae, masticatory apparatus, 161
 Bradypus, masticatory apparatus, 161
brevicauda, *Blarina*, 218
 Proechimys, 201
brevilineatus, *Eumeces*, 78, 87
brevirostris, *Brachyramphus*, 187
brevis, *Coleonyx*, 78, 82
browni, *Micrurus*, 29
Bufo compactilis, 99
 insidior, 79, 99
 marinus, 99
 punctatus, 79, 99
 valliceps, 99
woodhousii, 79

calidior, *Proechimys*, 201
Calidris rufus, 184
californianus, *Mytilus*, 13, 14
californica, *Halosydna*, 15
californiensis, *Botula*, 8
callens, *Mordellistena*, 127
Callithaca staminea, 11
cana, *Ficimia*, 78, 93
 Canidae, auditory ossicles, 54, 57
 auditory region of skull, 34–36, 50
Canis familiaris, auditory region, 34
 latrans, auditory region, 34
 lupus, auditory region, 34
canum, *Gyalopion*, 139
Gyalopium, 93
carditoides, *Petricola*, 8
carinatipennis, *Mordellistena*, 125
 Carnivores, arctoid, auditory region, 33
carolinus, *Euphagus*, 189
catatina, *Peromyscopsylla*, 218
Caudisona lepida, 94, 113, 151
cayennensis, *Proechimys*, 198
cesta, *Cythara (Mangelia)*, 15
Chama (Chama) *congregata*, 19
 felis, 19
chevrolati, *Mordella*, 124
Chloritis, 21
Chloeoepus, masticatory apparatus, 161
Chordeiles minor, 187
Chrysallida (Chrysallida) ornatis-sima, 4
 oregonensis, 7
 ornatissima, 7
Chthamalus fissus, 14
cinctipes, *Petrolisthes*, 14
Cirolana harfordi, 14
Cistudo ornata, 82
cistica, *Lasaea*, 15, 16
Clethrionomys sp., 217
clypeata, *Spatula*, 183
Cnemidophorus grahamii, 78, 85
 gularis, 78, 107
 inornatus, 106

 octolineatus, 78, 85, 107
 perplexus, 78, 86
 tessellatus, 78, 85, 106
coahuila, *Terrapene*, 101
Colaptes borealis, 187
Coleonyx brevis, 78, 82
Columbella (Alia) gausapata, 15
columbianus, *Cygnus*, 183
Colymbus auritus, 183
compactilis, *Bufo*, 99
compressa, *Orthopyxix*, 15
Conepatus mesoleucus, auditory region, 47
congregata, *Chama (Chama)*, 19
consobrinus, *Sceloporus*, 78, 83, 105
Cooperella subdiaphana, 8
 nest of, 12
Cophosaurus texanus, 82, 104
coralliphagus, *Musculus (Gregariella)*, 19
cornuta, *Agama*, 84, 106
cornutum, *Phrynosoma*, 78, 84, 106
Corvus principalis, 188
couchii, *Scaphiopus*, 98
Sceloporus, 106
couesi, *Arquatella*, 173, 185
 Erolia, 173
Crepidula (Janacus) nummaria, 15
crepitans, *Acris*, 100
Cribina xanthogrammatica, 14
Crotalus atrox, 78, 94, 114
 lepidus, 78, 94, 113, 151
 miquihuanaus, 151
 molossus, 78, 94, 114, 151
 viridis, 114
Crotaphytus baileyi, 78, 82, 103
 reticulatus, 103
 wislizenii, 104
Cryptotis parva, 218
cuneiformis, *Gastrochaena*, 19
curvata, *Doratopsylla (Corrodopsylla)*, 218
Cyanocephala suecica, 188
Cygnus columbianus, 183
cyrtopsis, *Eutaenia*, 88, 108
 Thamnophis, 78, 88, 107
Cythara (Mangelia) cesta, 15

 darwini, *Phyllotis*, 194
darwini, *Phyllotis*, 307
decumanus, *Proechimys*, 202
dekayi, *Storeria*, 149
Tropidonotus, 149
deserticola, *Salvadora*, 78, 91
desmoulini, *Helicigona (Chilostoma)*, 21
Diadophis blanchardi, 78, 89
diastema, *Micrurus*, 28
Diplodonta orbella, 8
 nest of, 9
Dipsas septentrionalis, 143
dispar, *Sceloporus*, 105

disparilis, *Sceloporus*, 105
dissecta, *Glaucinia*, 87
dissectus, *Leptotyphlops*, 78, 87
distans, *Micruurus*, 28
dolichonyx, *Akodon*, 196
dominica, *Pluvialis*, 184
Doratopsylla (*Corrodopsylla*) *curvata*, 218
 hamiltoni, 218
dropkini, *Mordellistena*, 126
Drymarchon *obsolete*, 110
Drymobius *margaritiferus*, 138
dulcis, *Leptotyphlops*, 135
 Rena, 135
duma, *Peromyscopsylla*, 217
Dusicyon *thous*, auditory region, 34
dybasi, *Mordella*, 123
dychei, *Reithrodontomys*, 206

Elaphe *bairdi*, 78, 91
 laeta, 110
 subocularis, 78, 91, 111
Elaps *tenere*, 113
elassopus, *Proechimys*, 203
elegans, Arizona, 78, 92, 111
 Emy, 101
 Pseudemys, 101
Eleutherodactylus *latrans*, 99
emoryi, *Aspidonectes*, 82, 103
 Platypeltis, 78, 82, 103
Emys *elegans*, 101
Engystoma *olivaceum*, 100
Epitedia, 215 (key)
 faceta, 215
 stanfordi, 214
 wenmanni, 214
Erema *hasselquisti*, 20
 zitteli, 20
Ereunetes *mauri*, 170, 184
 pusillus, 170, 184
eriomerus, *Petrolisthes*, 14
Erolia *couesi*, 173
 kuriensis, 178
 ptilocnemis, 170
 quarta, 177
 tschuktschorum, 174
Erosaria (*Ocellaria*) *spurca*, 20
erythrogaster, *Hirundo*, 187
erythromelas, *Piranga*, 189
esculenta, *Psoralea*, 208
Euarctos *americanus*, auditory region, 45
Eumeces *brevilineatus*, 78, 87
 obsolete, 78, 87, 107
Eunice *biannulata*, 15
Eupagus *carolinus*, 189
Eupomatus sp., 14
Eutaenia *cyrtopsis*, 88, 108
 marciana, 88, 108
evelynae, *Hyla*, 156
Exiliberus, 20
 jacksoni, 20

exustus, *Mytilus*, 16
faceta, *Epitedia*, 215
 Neopsylla, 215
Falco *alascanus*, 183
 anatum, 184
 bendirei, 184
felis, *Chama*, 19
Ficimia *cana*, 78, 93
 streckeri, 139
filosa, *Mitromorpha*, 15
fissus, *Chthamalus*, 14
flavescens, *Kinosternon*, 81, 101
 Platythra, 101
fulva, *Pluvialis*, 184
fuscicollis, *Pisobia*, 184
fuscodorsalis, *Mordellistena*, 127

gaigeae, *Pseudemys*, 78, 81, 101
 Syrrhopus, 80
gambeli, *Zonotrichia*, 190
Gastrochaena *cuneiformis*, 19
 heans, 19
Gastrophryne *olivacea*, 100
gausapata, *Columbella* (*Alia*), 15
Gavia *adamsi*, 182
 elasson, 182
 pacifica, 182
 stellata, 182
Georgia *obsoleta*, 110
Gerrhonotus *infernalis*, 84, 106
 Giant panda, masticatory apparatus, 61
glaucescens, *Larus*, 186
Glaucinia *dissecta*, 87
goeldii, *Proechimys*, 199
 grahamii, *Cnemidophorus*, 78, 85
 Salvador, 78, 91
granulatus, *Mytilus*, 16
gualtierianus, *Iberus*, 20
guatemalensis, *Mordellistena*, 128
Guerlinguetus, 192
gularis, *Cnemidophorus*, 78, 107
 Proechimys, 201
Gulo *luscus*, auditory region, 47
Gyalopion *canum*, 139
Gyalopium *canum*, 93

hairiness in *Polygyridae*, 21
Halosydna *californica*, 15
 hamiltoni, *Doratopsylla* (*Corrodopsylla*), 218
Haminea (*Haminea*) *virescens*, 15
harfordi, *Cirolana*, 14
 hasselquisti, *Erema*, 20
Helicigona (*Chilostoma*) *acrotricha*, 21
 desmoulini, 21
Helictis *taxilla*, auditory region, 47
Hemigrapsus *oregonensis*, 14
Hemitrichia, 21
 hendeei, *Proechimys*, 199, 202
Herpetodryas *margaritiferus*, 138
Heterodon *kennerlyi*, 109

hians, *Gastrochaena* (*Gastrochaena*), 19
hidalgensis, *Storeria*, 149
hilda, *Proechimys*, 201
himantopus, *Micropalama*, 184
hirsutiusculus, *Pagurus*, 14
Hirundo erythrogaster, 187
 rustica, 187
 tytleri, 188
Holbrookia approximans, 104
 maculata, 78
 texana, 78, 82, 104
Homalocranium atriceps, 93, 112
hyemalis, *Junco*, 190
Hyla albofrenata, 158
 arenicolor, 81, 100
 evelynae, 156
 lindneri, 158
 sanborni, 155
 uruguaya, 158
Hylocichla aliciae, 188
hyperboreus, *Larus*, 186
Hypsilegna ochrorhynchus, 78, 93, 112

Iberus alonensis, 20
 gualtierianus, 20
ignitus, *Sciurus*, 192
iliaca, *Passerella*, 190
immer, *Gavia*, 182
implicata, *Polygyra* (*Daedalocheila*), 20
inca, *Oxymycterus*, 198
infernalis, *Gerrhonotus*, 78, 84, 106
inornatus, *Cnemidophorus*, 106
insidior, *Bufo*, 79, 99
interpres, *Arenaria*, 170
interruptilineata, *Alaba*, 17
Iridoprocne bicolor, 187

jacksoni, *Exiliberus*, 20
jani, *Arizona*, 145
 Pituophis, 145
Jellisonia, 211
 klotzi, 212
juliaca, *Oxymycterus*, 198
Junco hyemalis, 190

kennerlyi, *Heterodon*, 78, 109
kennicotti, *Acanthopneuste*, 188
Kinosternon flavescens, 78, 81, 101
klotzi, *Jellisonia*, 212
kumlieni, *Larus*, 186
kuriensis, *Arquatella*, 178
 Erolia, 178

laeta, *Elaphe*, 110
laetus, *Scotophis*, 110
lamellifera, *Venerupis*, 8
Lampropeltis alterna, 78, 111, 141
 annulata, 112
 leonis, 141
 mexicana, 141
 splendida, 78
 thayeri, 140

Larus argentatus, 186
 barrovianus, 186
 glaucescens, 186
 hyperboreus, 186
 kumlieni, 186
 leucopterus, 186
 thayeri, 186
Lasaea cistula, 15, 16
 miliaris, 17
 subviridis, 14, 16
latemaculata, *Mordella*, 122
laterale, *Leilopisma*, 107
lateralis, *Scincus*, 107
laticollis, *Mordellistena*, 129
latrans, *Eleutherodactylus*, 99
 Lithodytes, 99
Leilopisma laterale, 107
leonis, *Lampropeltis*, 141
lepida, *Caudisona*, 94, 113, 151
lepida, *Tachycineta*, 187
lepidus, *Crotalus*, 78, 94, 113, 151
leporina, *Polygyridae* (*Lobosculum*), 21
Leptodeira maculata, 142
 septentrionalis, 143
Leptophis mexicanus, 143
Leptopsylla, 212
Leptotyphlops dissectus, 78, 87
 dulcis, 135
 myopicus, 136
 segregus, 78, 88, 108
leucoptera, *Lovia*, 189
leucopterus, *Larus*, 186
limatus, *Phyllotis*, 194
Limnodromus scolopaceus, 184
Limnomedusa macroglossa, 154
 misionis, 153
Limosa baueri, 185
linaria, *Acanthis*, 189
lindneri, *Hyla*, 158
lineata, *Salvadora*, 110, 148
lineatocollis, *Mordellistena*, 125
lineicaudatus, *Andinomys*, 195
Lithodytes latrans, 99
Lithophaga, boring of, 7
 plumula, 8
Littorina (*Melaraphe*) *planaxis*, 14
longicaudatus, *Proechimys*, 198
longicaudus, *Stercorarius*, 185
Loxia leucoptera, 189
ludoviciana, *Piranga*, 189
lunulata, *Mordella*, 120
lurida, *Ostrea* (*Ostreola*), 14
lutescens, *Akodon*, 196
 Phyllotis, 194
Lutra canadensis, auditory region, 47
Lycaon pictus, auditory region, 34

macroglossa, *Limnomedusa*, 154
maculata, *Holbrookia*, 78
 Leptodeira, 142
maculatus, *Megalops*, 142

magellanicus, *Mytilus*, 16
Oryzomys, 195
 magister, *Phyllotis*, 194
 Sceloporus, 78, 83, 105
marciana, *Eutaenia*, 88, 108
marcianus, *Thamnophis*, 78, 88, 108
Mareca americana, 183
margariferus, *Drymobius*, 188
 Herpetodryas, 188
marina, *Rana*, 99
marinus, *Bufo*, 99
marmoratus, *Sceloporus*, 105
 Masticatory apparatus, in giant panda,
 bears, 61
 in sloths, 161
Masticophis ornatus, 78, 90
 schotti, 109
 testaceus, 78, 90, 110, 144
mauri, *Ereunetes*, 170, 184
Megalops maculatus, 142
melaena, *Mordella*, 120
melanocephala, *Arenaria*, 170
melanotos, *Pisobia*, 184
Melurus ursinus, auditory region, 45
Mephitis mesomelas, auditory region, 47
merriami, *Sceloporus*, 78, 83
metallica, *Mordella*, 121
mexicana, *Lampropeltis*, 141
mexicanus, *Leptophis*, 143
michoacanensis, *Micrus*, 28
microglypta, *Alvania (Willetia)*, 2
Micropalama himantopus, 184
Microtus sp., 217
Micrurus browni, 29
 diastema, 28
 distans, 28
 michoacanensis, 28
 ovandoensis, 26
 taylori, 30
 tenere, 113
 zunilensis, 26
migratorius, *Turdus*, 188
miliaris, *Lasaea*, 17
Mimometopon sapperi, 136
minor, *Chordeiles*, 187
miquihuuanus, *Crotalus*, 151
misionis, *Limnomedusa*, 153
Mitella polymera, 14
Mitromorpha filosa, 15
modestum, *Phrynosoma*, 78, 84, 106
molossus, *Crotalus*, 78, 94, 114, 151
montana, *Phadinaea*, 145
Mordella apicicornis, 124
 chevrolati, 124
 dybasi, 123
 latemaculata, 122
 lunulata, 120
 melaena, 120
 metallica, 121
 novemnotata, 118
 pubescens, 121
 rufocinerea, 121
 septemnotata, 119
 sticticoptera, 124
 triangulifer, 123
 uniformis, 120
 univittata, 120
 xanthosticta, 124
Mordellistena aequinoctialis, 127
 angulata, 129
 atripennis, 131
 callens, 127
 carinatipennis, 125
 dropkini, 126
 fuscodorsalis, 127
 guatemalensis, 128
 laticollis, 129
 lineatocollis, 125
 multicarinata, 124
 obscurinotata, 130
 pilipennis, 131
 quadrifasciata, 128
 subaenea, 130
 verae pacis, 127
 vestita, 132
morinella, *Arenaria*, 184
Motacilla alascensis, 189
multicarinata, *Mordellistena*, 124
multiformis, *Mytilus*, 16
Musculus (Gregariella) coralliphagus,
 19
Mustela nigripes, auditory region, 47
Mustelidae, auditory ossicles, 57, 58
 auditory region of skull, 47–49, 51
Mytilus (Aulacomya) californianus, 13,
 14
 californianus association, 12
 exustus, 16
 granulatus, 16
 magellanicus, 16
 multiformis, 16
 stearnsii, 16
Nasua narica, auditory region, 36
nasutus, *Oxymycterus*, 197
Natrix transversa, 78, 88, 108
Neopsylla faceta, 215
Nereis vexillosa, 14
nigritrons, *Oxymycterus*, 197
nigrofulvus, *Proechimys*, 199
nogalaris, *Phyllotis*, 194
Notarchus (Aclesia) pleii, 18
novemnotata, *Mordella*, 118
nummaria, *Crepidula (Janacus)*, 15
Nuttallina scabra, 14

obscurinotata, *Mordellistena*, 130
obsoleta, *Georgia*, 110
obsoletum, *Plestiodon*, 87, 107
obsoletus, *Drymarchon*, 110
 Eumeces, 78, 87, 107
ochracea, *Spizella*, 190
ochraceus, *Pisaster*, 15

ochrorhynchus, *Hypsiglena*, 78, 93, 112
 octolineatus, *Cnemidophorus*, 85, 107
 Oenanthe oenanthe, 188
 olivacea, *Gastrophryne*, 100
olivaceum, *Engystoma*, 100
 olivaceus, *Sceloporus*, 105
 Opheodrys aestivus, 145
Ophibolus alternus, 111
 orbella, *Diplodontia*, 8
 orcuttiana, *Scala (Globiscala)*, 15
 oregonensis, *Chrysallida*, 7
 Hemigrapsus, 14
 oris, *Proechimys*, 199
 ornata, *Cistudo*, 82
 Terrapene, 78, 82
ornatissima, *Chrysallida*, 4, 7
 ornatus, *Masticophis*, 78, 90
Orthopyxis compressa, 15
Oryzomys magellanicus, 195
 philippii, 195
 xanthaeolus, 192
 osilae, *Phyllotis*, 194
 Ossicles, auditory region of arctoid car-
 nivores, 52
Ostrea (Ostreola) *lurida*, 14
Otocoris arcticola, 187
ovandoensis, *Microtus*, 26
Oxyechus vociferus, 184
Oxymycterus inca, 198
 juliaca, 198
 nasutus, 197
 nigrifrons, 197
 paramensis, 197

 pachita, *Proechimys*, 202
 pacifica, *Gavia*, 182
 Pelidna, 184
Pagurus hirsutiusculus, 14
paramensis, *Oxymycterus*, 197
parasiticus, *Stercorarius*, 185
parva, *Cryptotis*, 218
Passerella iliaca, 190
 unalascensis, 190
Pecten (Nodipecten) antillarum, 19
pectoralis, *Reithrodontomys*, 205
Pelidna pacifica, 184
pellucens, *Auriculastra*, 18
Penthestes turneri, 188
Peromyscopsylla, 212
 catastina, 218
 duma, 217
 selenis, 217
Peromyscus sp., 217
 truei, 214
perplexus, *Cnemidophorus*, 78, 86
persona, *Acmaea (Collisella)*, 15
Petricola carditoides, 8
Petrochelidon albifrons, 187
Petrolisthes cinctipes, 14
 eriomerus, 14
phaeus, *Phyllotis*, 193
 philippii, *Oryzomys*, 195
 Phyllotis abrocodon, 194
 andium, 194
 arenarius, 194
 darwini, 194
 darwini, 207
 limatus, 194
 lutescens, 194
 magister, 194
 nogalaris, 194
 osilae, 194
 phaeus, 193
 posticalis, 194
 ricardulus, 194
 rupestris, 194
 tucumanus, 194
 vaccarum, 194
 wolffsohni, 194
Phrynosoma cornutum, 84, 106
 modestum, 78, 84, 106
pictigaster, *Akgistrodon*, 78, 94
pilipennis, *Mordellistena*, 131
Piranga erythromelas, 189
 ludoviciana, 189
Pisaster–Mytilus–Mitella association,
 13
Pisaster ochraceus, 15
Pisobia bairdi, 184
 fuscicollis, 184
 melanotos, 184
Pituophis jani, 145
 sayi, 78, 92, 111
planaxis, *Littorina (Melaraphe)*, 14
Platypeltis emeryi, 78, 82, 103
Platythrya flavescens, 101
pleii, *Notarchus (Aclesia)*, 18
Pleochaetus, 212
Plestiodon obsoletum, 87, 107
plumula, *Lithophaga*, 8
Pluvialis dominica, 184
 fulva, 184
poinsettii, *Sceloporus*, 78, 84, 104
polius, *Akodon*, 196
Polygyra (Daedalocheila) implicata, 20
Polygyridae (Lobosculum) leporina, 21
polymera, *Mitella*, 14
posticalis, *Phyllotis*, 194
Potos flavus, auditory region, 39, 51, 54
principalis, *Corvus*, 188
Procyon lotor, auditory region, 36
Procyonidae, auditory region of skull,
 36–39, 50
Proechimys arescens, 198
 boimensis, 199
 brevicauda, 201
 calidior, 201
 cayennensis, 198
 decumanus, 202
 elassopus, 203
 goeldii, 199
 gularis, 201
 hendeei, 199, 202
 hilda, 201

longicaudatus, 198
nigrofulvus, 199
 oris, 199
 pachita, 202
 rattinus, 202
 rosa, 202
 semispinosus, 200
 simonsi, 202
 steerei, 204
Prosthioctomum sp., 14
proximus, *Thamnophis*, 109, 150
Pseudemys elegans, 101
 — *gaigeae*, 78, 81, 101
Psoralea esculenta, 208
ptilocnemis, *Erolia*, 170
ptilocnemis, *Tringa*, 170
pubescens, *Mordella*, 121
Puffinus tenuirostris, 183
pugetana, *Amphiphilus*, 15
punctatus, *Bufo*, 79, 99
pusilla, *Wilsonia*, 189
pusillus, *Ereunetes*, 170, 184
quadrifasciata, *Mordellistena*, 128
quarta, *Erolia*, 177

Rana berlandieri, 81, 100
 — *marina*, 99
rattinus, *Proechimys*, 202
Reithrodontomys dychei, 206
 — *pectoralis*, 205
Rena dulcis, 135
Retepora pacifica, 14
reticulata, *Arca (Barbatia)*, 19
reticulatus, *Crotaphytus*, 103
Rhadinaea montana, 146
Rhinocheilus tessellatus, 78, 92, 112
Rhodostethia rosea, 186
rhombifer, *Tropidonotus*, 108, 144
ricardulus, *Phyllotis*, 194
rosa, *Proechimys*, 202
rosea, *Rhodostethia*, 186
rubescens, *Anthus*, 189
rubra, *Tantilla*, 149
rufocinerea, *Mordella*, 121
rufus, *Calidris*, 184
rupestris, *Phyllotis*, 194
rustica, *Hirundo*, 187

Salvadora deserticola, 78, 91
 — *grahamii*, 78, 91
 — *lineata*, 110, 148
sanborni, *Hyla*, 155
 — *Sciurus*, 191
sapperi, *Amastridium*, 136
 — *Mimometon*, 136
scabra, *Acmaea (Collisella)*, 14
 — *Nuttallina*, 14
Scala (Globiscala) orcuttiana, 15
Scaphiopus couchii, 98
Sceloporus annulatus, 78, 84, 104
 — *consobrinus*, 78, 83, 105
 — *couchii*, 106
 — *dispar*, 105
 — *disparilis*, 105
 — *magister*, 78, 83, 105
 — *marmoratus*, 105
 — *merriami*, 78, 83
 — *olivaceus*, 105
 — *poinsettii*, 78, 84, 104
 — *schmidti*, *Uta*, 78, 83
 — *schotti*, *Masticophis*, 109
Scincus lateralis, 107
Sciurus aestuans, 192
 — *ignitus*, 192
 — *sanborni*, 191
scolopaceus, *Limnodromus*, 184
Scotophilus laetus, 110
Segall, Walter. Auditory region of the arctoid carnivores, 33
segregus, *Leptotyphlops*, 78, 88, 108
selenis, *Feromyscopsylla*, 217
semispinosus, *Proechimys*, 200
septemnotata, *Mordella*, 119
septentrionalis, *Dipsas*, 143
 — *Leptoidea*, 143
Septifer bifurcatus, 15, 16
Sicher, Harry. Masticatory apparatus in giant panda and bears, 61
simonis, *Proechimys*, 202
Sonora semiannulata, 78, 93
Spatula clypeata, 183
spiegazzinii, *Akodon*, 196
Spizella ochracea, 190
splendida, *Lampropeltis*, 78
spurca, *Erosaria (Ocellaria)*, 20
Squatarola, 184
staminea, *Callithaca*, 11
stanfordi, *Epitedia*, 214
stearnsii, *Mytilus*, 16
steerei, *Proechimys*, 204
stejnegeri, *Uta*, 78, 83, 104
stellata, *Gavia*, 182
Stenostoma myopicum, 136
Stercorarius longicaudus, 185
 — *parasiticus*, 185
sticticoptera, *Mordella*, 124
Storeria dekayi, 149
 — *hidalgoensis*, 149
streekeri, *Ficimia*, 139
subaenea, *Mordellistena*, 130
subdiaphana, *Cooperella*, 8
subfuscus, *Akodon*, 195
subocularis, *Elaphe*, 78, 91, 111
subruficollis, *Tryngites*, 185
subviridis, *Lasaea*, 14, 16
suecica, *Cyanocephala*, 188
Syrhopus gaigeae, 80

Tachycineta lepida, 187
Tantilla atriceps, 78, 93, 112
 — *rubra*, 149
Taxidea taxus, auditory region, 47
taylori, *Micrurus*, 30

Tayra *barbara*, auditory region, 47
tenere, *Elaps*, 113
 Micrurus, 113
tenuirostris, *Puffinus*, 183
Terrapene coahuila, 101
 ornata, 78, 82
tessellata, *Ameiva*, 106
tessellatus, *Cnemidophorus*, 78, 85, 106
 Rhinocheilus, 78, 92, 112
testaceus, *Masticophis*, 78, 90, 110, 144
texana, *Holbrookia*, 78, 82, 104
texanus, *Cophosaurus*, 82, 104
Thalarcos maritimus, auditory region,
 45
Thamnophis cyrtopsis, 78, 88, 108
 marcianus, 78, 88, 108
 proximus, 109, 150
thayeri, *Lampropeltis*, 140
 Larus, 186
Tomaxia xenicornis, 117
transversa, *Natrix*, 78, 88, 108
transversus, *Tropidonotus*, 88, 108
Tremarctos ornatus, auditory region,
 45
triangulifer, *Mordella*, 123
Trimorphodon vilkinsonii, 78
Tringa pilocnemis, 170
Tropidonotus dekayi, 149
 rhombifer, 100, 144
 transversus, 88, 108
truei, *Peromyscus*, 214
Tryngites subruficollis, 185
tschuktschorum, *Arquatella*, 174
 Erolia, 174
tucumanensis, *Akodon*, 196
tucumanus, *Phyllotis*, 194
Turdus migratorius, 188
turneri, *Penthestes*, 188
tytleri, *Hirundo*, 188
unaliaschensis, *Passerella*, 190
uniformis, *Mordella*, 120
univittata, *Mordella*, 120
Uria arra, 186
Ursidae, auditory ossicles, 56, 58
 auditory region of skull, 45–47, 50
 masticatory apparatus, 61 ff.
Ursus arctos, auditory region, 45
uruguaya, *Hyla*, 158
Uta schmidti, 78, 83
 stejnegeri, 78, 83, 104
vaccarum, *Phyllotis*, 194
valliceps, *Bufo*, 99
Venerupis lamellifera, 8
veraepacis, *Mordellistena*, 127
vestita, *Mordellistena*, 132
vexillosa, *Nereis*, 14
vilkinsonii, *Trimorphodon*, 78
virescens, *Haminea* (*Haminea*), 15
viridis, *Crotalus*, 78, 114
vociferus, *Oxyechus*, 184
wenmanni, *Epitedia*, 214
Wilsonia pusilla, 189
wislizenii, *Crotaphytus*, 78, 104
wolffsohni, *Phyllotis*, 194
woodhousii, *Bufo*, 79
xanthaeolus, *Oryzomys*, 192
xanthogrammatica, *Cribina*, 14
xanthosticta, *Mordella*, 124
xenicornis, *Tomaxia*, 117
zitteli, *Eremaea*, 20
Zonotrichia gambeli, 190
zunilensis, *Micrurus*, 26





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